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## OBSERVATIONS ON HYRAX.

BY HENRY C. CHAPMAN, M.D.

The structure of *Hyrax* has been so thoroughly investigated by Pallas,[1] Owen,[2] Brandt,[3] Mirie and Mivart,[4] and George,[5] as well as by other anatomists, that little or nothing remains now to be said by any one to whom the rare opportunity is afforded of dissecting this interesting animal. In exhibiting to the Academy the muscular system and viscera of a fine male specimen of *Hyrax* (*Procavia Brucei*), most kindly put at the disposition of the writer by Messieurs Edmond, Perrier and Gervais, of the Jardin des Plantes, Paris, attention was nevertheless called to the fact that the figures illustrating the form of stomach as offered by Pallas, Brandt and George give an imperfect, even an erroneous, idea of that of the stomach of the *Hyrax* dissected by the writer. According to the anatomists just referred to, the cardiac portion of the stomach in *Hyrax* is large and globular, the pyloric portion small and narrow, whereas exactly the reverse obtains in the stomach of the specimen submitted to the writer (fig. 1). Inasmuch as the narrow cardiac portion of the stomach is extremely muscular in *Hyrax*, it might be supposed that such condition may have been due to the fluid in which the specimen had been preserved. In the judgment of the writer the marked difference in contour presented by the two regions of the stomach cannot be so accounted for. In confirmation of the view that the form of the stomach so found was normal and not due to post-mortem

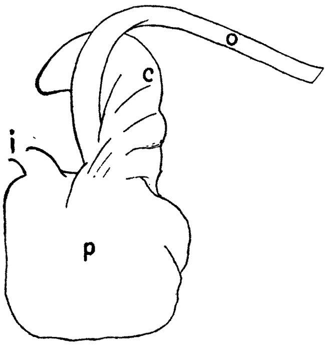

Fig. 1.

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[1] *Spicilegia Zoologica*, 1767, p. 16.

[2] *Proc. Zool. Soc. London*, 1832, p. 202.

[3] *Mémoires de l'Acad. Imp. des Sciences de St. Péterbourg*, VII Sér., Tome XIV.

[4] *Proc. Zool. Soc. London*, 1865, p. 329.

[5] *Annales des Sciences Nat.*, 6me Serie, I, 1874.

contraction, it should be mentioned that when the animal was opened, although the two parts of the stomach were distended with food, it nevertheless presented two distinct cardiac and pyloric portions. At the same time the small intestine was empty, which would not have been the case had the stomach contracted to any extent upon its contents. It is well known that in the six-banded armadillo (*Dasypus sexcinctus*), in the two-toed ant eater (*Myrmecophaga didactyla*) and in the two-toed sloth (*Cholœpus Hofmanni*) the cœcum presents two cœcal processes, and in *Hyrax*, in addition to a cœcum proper, the alimentary canal is provided with a second dilatation, terminating also in two cœcal processes resembling somewhat those just referred to as occurring in the edentates just mentioned. It will be observed, however, that the two cœcal processes found in *Hyrax*, but in no other mammal, so far as is known to the writer, are appendages of the colon and not of the cœcum proper. The significance of these colonic appendages is not known.

The length of the alimentary canal in *Hyrax* is as follows according to

| | Owen | George | Chapman |
|---|---|---|---|
| Small intestine, . . . . . . . . | 54 | 64 | 38 inches. |
| Cœcum, . . . . . . . . . . . | 3 | 4 | 4 " |
| Colonic cœcum, . . . . . . . | | 3[6] | 6 " |
| Large intestine, . . . . . . . . | 58 | 52 | 35 " |
| | 112 | 120 | 77[6] |

The length of the alimentary canal was nearly five times that of the animal, measured from snout to anus, a ratio not differing essentially from that of Owen[7] and George.[8]

The villi of the small intestine of *Hyrax*, as is well known, are remarkably well developed, indeed as long proportionally as in the rhinoceros.[9] The attention of anatomists does not appear, however, to have been directed to the fact that some of the villi are longer than others, the former terminating in branched or club-like processes (fig. 2), resembling somewhat the villi of the Indian rhinoceros studied by the writer. In view of the difference of opinion that has prevailed among systematists as to the affinities of *Hyrax* with the remaining mammalia, this fact might be urged as confirming the view held by Cuvier[10] and Owen,[11] that *Hyrax* is nearly related to the rhinoceros, as shown by its rhinoceros-like incisor and molar teeth, the incisor teeth being developed as in the extinct *Rhinoceros incisivus*, the molar teeth presenting essentially the same pattern in both animals; the position of the œsophagus in regard to the stomach, the relatively simple stomach and complex cœcum, the perissodactyle number of ribs 22, the hoofs of the unsymmetrical tetradactyle fore-foot and tridactyle hindfoot as in *Aceratherium*, an extinct hornless rhinoceros, etc. On the other hand, as first shown by Home,[12] the placenta in *Hyrax* is zonular, like that of the elephant and carnivora—a fact somewhat inconsistent with the view that would regard *Hyrax* as a little rhinoceros. Still, it must be admitted, since it has been shown by the writer[13] that the same kind of mammals (*Edentata*) may have different form of placenta and different kinds of mammals the same form, that the form of the placenta is of little or no value in the classification of the mammalia. In the absence of fossil remains of *Hyrax*, though the extinct *Hyracotherium* may be somewhat allied, it is impossible to assign *Hyrax* to any living form of mammals. For the present, therefore, it may be regarded as *sui generis* the representative of an extinct order Hyracoidea, of which *Dendrohyrax* is also a member. As a matter of record, it may be stated that fragments of a species of tapeworm (*Moniezia*) were found in the small intestine, and also a number of specimens of *Ascaris ferox*, as identified by my colleague, Prof. Percy Moore. In regard to the urogenital apparatus, its disposition was found to be essentially the same as described by Pallas, George, etc. In the specimen of *Hyrax* dissected by the writer, the testicles were found lying in the abdominal cavity below the kidneys, and were longer rather than shorter than the latter, as hitherto described. The ureters opened into the fundus of the bladder, the aperture of the left one being situated a trifle lower than that of the right one. The *vasa deferentia*, as they pass behind the bladder, become so much convoluted as to resemble a second epididymis, terminating finally in two openings situated in the under part of the *veru montanum* of the urethra. The lower convoluted portions of the *vasa deferentia*, just referred to,

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[6] Exclusive of colonic cœca.

[7] *Op. cit.*, p. 204.

[8] *Op. cit.*, p. 38.

[9] Meckel, *Systeme der vergleichenden Anatomie*, Band IV, S. 595.

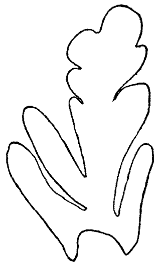

Fig. 2.

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[10] *Ossemens Fossiles*, 1834, Tome 3, p. 251.
[11] Owen, *Anat. of Vertebrates*, III, p. 742.
[12] *Lect. on Comp. Anat.*, Vol. VI, 1828, Pl. 61–62.
[13] *Proc. of Acad. of Nat. Sci. Phila.*, 1901, p. 366.

are regarded by George[14] as performing the functions of seminal vesicles. Owen, however, states[15] having found true seminal vesicles quite distinct from the convoluted portions of the *vasa deferentia* just mentioned. Further, there are two additional pairs of glands, the ducts of the first opening into the upper portion of the *veru montanum*, those of the second into the bulb of the urethra, and regarded respectively by George[16] as prostate and Couper's glands. The prostate glands were considered by both Pallas[17] and Cuvier[18] to be the seminal vesicles, but as the ducts of the latter terminate by openings quite distinct from those of the *vasa deferentia*, their nature as interpreted by George is probably the correct one. The levatores muscles of the penis arise from the symphysis pubis, and terminate in a single tendon, as was the case in the rhinoceros dissected by the writer, a disposition first noticed by Owen.[19] The erectores and acceleratores muscles were well developed.

The *Hyrax* is regarded by naturalists and Biblical scholars as being the animal referred to in the Bible as the "coney"—the שפן (saphan) of the Hebrews and the χοιρογρυλλιος of the Greeks. The Hebrews were forbidden by their law to make use of the coney as an article of food, it being considered by them to be unclean, "because he cheweth the cud, but divideth not the hoof" (Lev. xi. 5). Biblical scholars, in their efforts to determine what kind of an animal the coney of the Bible really was, do not appear, however, so far as known to the writer, to have noticed that, according to readings of Tischendorff and Van Ess, *Vetus Test Græce* (Leviticus xi. 5), the coney does not chew the cud, "και τον χοιρογρυλλιον, οτι ουκ αναγει μηρυκισμον"; whereas, according to Deuteronomy xiv. 7, it does chew the cud, "και ταυτα ου φαγεσθε απο των αναγοντων μηρυκισμον." There is no such discrepancy of reading, however, between the corresponding texts in the Hebrew, the Vatican Codex[20] and Sweet's Septuagint, the Latin and English versions of the Bible, it being stated in all the versions that the coney cheweth the cud. As a matter of fact the *Hyrax* does not chew the cud, even though the movements of its jaws during feeding would suggest such action. Its stomach, though divided into two distinct regions, is not adapted for rumination, and the animal has never been observed to perform that act either in the wild state or in captivity. It is possible, therefore, that the *Hyrax* of Syria, after all, is not the animal referred to in the Bible as the coney, even though the rocks were a refuge for the latter, according to the Psalmist (civ. 18), as they still are for the *Hyrax*, and that the coneys, like the *Hyrax*, are a "feeble folk, yet make their houses in the rocks" (Prov. xxx. 26). On the other hand, if the *Hyrax* is still to be regarded as the coney, as the Arabs think, then the Biblical texts in which it is stated that the coney cheweth the cud should be revised to make them consistent with what is known to be the habit of *Hyrax* in this respect.

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[14] *Op. cit.*, p. 192.
[15] *Op. cit.*, p. 206.
[16] *Op. cit.*, p. 193.
[17] *Op. cit.*, p. 29.
[18] *Anat. Comp.*, Tome VIII, p. 165.
[19] *Op. cit.*, p. 207
[20] It is a curious fact that notwithstanding the Tischendorff Septuagint is supposed to be an exact copy of the Vatican Codex, the ουκ that occurs in the former (Lev. xi. 5) is absent in the latter, and that no reason is given for the variant reading. The writer takes the opportunity of expressing his thanks to Prof. W. C. Lamberton, the distinguished Greek scholar, for giving him the opportunity of consulting the different Greek versions of the Old Testament referred to in the text.